of nature; Natural Philosophy instructs us in spelling; and Chemistry in reading distinctly. To serve as an introduction to such an important science generally, and also to extend a knowledge of its practical elements among those who influence the studies of the rising generation, are the objects of the present publication. The natural philosophy of the last century included not only what is taught at the present day under that title, but likewise chemistry and astronomy. The two latter have now become distinct sciences, but they no longer, as they formerly did, constitute part of the usual studies of the clerical and scholastic professions, although the phenomena of which chemistry treats are of the most familiar occurrence, and many of the laws which it developes of constant domestic application. These, too, afford easily appreciable proofs of design. But if we desire examples of a more sublime nature, we have only to consult the details of inorganic chemistry, constituting the first part of the volume, to find evidence that the ultimate particles of matter, so minute as to weigh less than the billionth part of a grain, have been impressed with unvarying laws, and adjusted with skill so admirable, as to impel us to the literal conclusion of the sacred writer, that the Divine Being has 'comprehended the dust of the earth in a measure, weighed the mountains in scales, and the hills in a balance.' When we turn to vegetable chemistry, we learn that the same materials with which we become intimate in the mineral world, in one perpetual round, serve for the support and nourishment of all the plants which subsist upon the face of the globe. But the vegetable world, consisting merely of matter endowed with the power of nourishing itself, and without any nerves or sensibility, must be viewed as the garden of those beings to whom we afterwards proceed, where sense and intellect, in all their efficiency, discover the image of a Mighty Creator."

Mr. Tomlinson has very properly only attempted to excite an interest in the study of principles, by making facts and details subordinate to this higher aim. Dr. Thomson—the inheritor of a name whose celebrity he will not diminish—has in his province made the condensation of facts and details one of his main objects, and in order to attain to this end all the more completely, he has used in subsidiary matters a smaller type than even the very economical one in which the book principally appears. Within so small a space we do not believe that such a mass of important facts in chemistry was ever before accumulated, or rather condensed,—for the multiplicity is to be attributed much more to a careful and successful condensation than even to the mere economy of type. Both works are in other respects well got up; they are full of illustrative cuts; and are very creditable to their respective publishers.

ON THE LAW OF WAVES.

A THEORY.

The waves, even of the deepest part of the ocean, must be limited by the rules of nature, the almighty power controlling into order all effects.

Most persons who have been at sea, in reply to inquiries on this subject, generally say that the waves are sometimes "mountains high," and that when in the hollow of them, the hull and most of the rigging of vessels in the opposite lower wave are hidden by the intervening elevated part. Many years since, a friend of mine refused a lucrative appointment in India, owing to a dread of sea-sickness, increased by his having seen a picture by Turner of an East-Indiaman, off the Cape of Good Hope, represented upon a wave, at least as high as Shooter's-hill.

Now, from such accounts as can be depended upon, the waves never rise more than about 30 feet above the common level, and sink to the same extent. This description, I consider, proves that the effect of the strongest wind, aided by accelerated motion and by oscillation, *cannot*, even in the open sea, *raise a wave higher than the weight of the atmosphere*, which upon an average may be about *equal to* 32 *feet depth of water*. Under this law, were the ocean to be of liquid mercury, no wave thereof, produced in any way by the force or action of the atmosphere, could be raised more than 31 inches. The medium weight of the atmosphere is 14½ ounces upon the superficial inch, acting, of course, in every direction. The lateral force of the wind in a storm, upon the superficial inch, is little more than 1 ounce, in a great storm 1½ ounce, in a hurricane 3 ounces, in a very great one 4 ounces, and in the most violent hurricane 6 ounces.

It is with some diffidence that I offer this theory, which I think is supported by the notice taken of the difference of the action on water and on quicksilver, as fluids of different density.

T. Higgs.

MISHAPS WITH CONTRACT-WORKS.

That terrible antagonist to railway contract works, the rain, appears to be playing havoc amongst viaducts and arches, as if, in place of having the constitution of a brick, their framework were that of a fine lady, whose frail organism would be likely to be injured even by the evening dews, far less be capable of withstanding the undermining inroads of the rain. Now that the tender mercies of summer have departed, we begin to renew our almost weekly record of "*unfortunate* accidents"—*unfortunate*, indeed, for everything seems to be dependent on *chance*, and nothing on *foresight* or *design*. The fatalities, too, have begun upon the wholesale system: one arch follows the example of another, and all come tumbling down by the dozen, just, as we have said, like recruits in the tumble-down rank and file of "Prussian Exercise." A jury had scarcely recorded its opinion of the insufficiency of the foundations of the Rother viaduct, when another, dubious of the soundness of its own understanding, fell ill of "an unforeseen settlement in the foundation of one of its piers," and we have now to record the utter prostration of four of its arches, and "doubt of the stability of the other seventeen,"—in all twenty-one, which constituted the North Rode viaduct over the river Dane, on the North Staffurd line. On the back of that *mischance*, too, comes the announcement of the "fall of one of the arches of the viaduct at Sheffield, on the Manchester, Sheffield, and Lincolnshire line," which "unexpectedly came down all except the facings," on Wednesday week. "It is supposed that the cause of the accident was the heavy rains which have recently fallen."——Much inconvenience, delay, and danger were incurred last week from the slipping of an embankment at Badgworth, on one of the Great Western lines. A great many labourers were *afterwards* employed to strengthen the embankment, and it *is to be* drained in the best manner practicable. It is needless to say that had the drainage and the strengthening preceded the slip, in place of following it, not only time but money would have been saved. If competition *will* compel the continuance of 'close cutting' contracts, without a willing allowance even for *chances* of failure, at least the aid of some skilful professor of the calculation of chances ought to be got, so that the 'close cutting' may no longer prove to be quite so suicidal as it but too often must have been.

RAILWAY JOTTINGS.

Mr. Shuard, the architect lately injured in the collision near Newton, and now said to have resided at Somerleyton, in Suffolk, has unexpectedly died of his injuries, at a moment when he appeared to be fast recovering from their effects.——With reference to another of the late accidents, in which an engine-driver had his right arm broken, and a rib fractured, a correspondent of the *Morning Herald*, himself "an old London and North-Western engine-driver," says, "It was impossible for Ross to prevent his engine running into the waggons, and yet, in addition to his injuries and sufferings, the London and North-Western authorities *have reduced him to half-pay*. Is this fair treatment, Sir, to a man who has been nearly killed *from the want of a proper auxiliary signal* from the ballast-hole to the Leighton station? *Such a signal is notoriously needful for the safe working of this dangerous portion of the line*. A careful and skilful driver is almost crippled for life *by the neglect of the Company*; and to assuage his sufferings this great Company cut off half his wages. Can Mr. Glyn know this? Is such treatment honourable to the Board over which that gentleman presides, or is it humane or just to the injured man?" Such a complaint needs no comment; but we should only like to know if this is considered to be one of those cases which justify the exaction of even "one-fifth of his annual salary" from any "railway servant," far less a whole half of it from one who has his right arm broken and a rib shattered from that very neglect or stinginess on the part of railway *masters*, to which we have ever insisted that such *accidents* are in general to be attributed. This is "mitigating the losses of the sufferers" with a vengeance! If true, it actually reflects more discredit on the 'railway management' than the poor fellow in Lincoln market-place, who had lost a leg, endeavoured lately to excite against such 'management,' by the exhibition of a rough sketch of the rail, with the interesting process of amputation vividly displayed in the foreground, and significantly illustrated by the plaintive assurance that "They wonet give me nothing." The management, in the present instance, appear to have ingeniously managed to give less than nothing, by one-half; for, in consequence of injuries occasioned by their own blame, they have deprived their "railway servant" of one-half of what he previously had.——The old idea of a Railway Casualty Compensation Company for the insurance of legs and arms, spines and skulls, originally suggested by *Punch*, has again been seriously started, and no wonder, since there seems to be nothing else for it but to content oneself with the next best to prevention which appears to be hopeless,—namely, mutual consolatory compensation for the inevitable damage when it does occur, as it may once in the life of every man, woman, and child, in the three kingdoms, these being all three nations of railway travellers. "It is what we must all come to," as the toothless old maiden remarked of the marriage ceremonial.——Our contemporaries are still busy, we see, recasting old ideas for the prevention of accidents or other casualties with trains in transit, and especially for communication between the passengers or guard and engine driver. One of these professes to obviate the objections we have frequently pointed out; and, without clearly perceiving where the hitch actually lies, inadvertently, as in other instances, blunders on it by accident. The apparatus referred to consists of a rather ultra-scientific adaptation of the electro-magnetic force to the purpose in view, with a clear distinction between the signal transmitted, to the driver, from a guard, and that from a mere passenger, so that if from the latter "the pace of the train need only be slackened until the guard *ascertains the carriage from which the signal is made, and the reason*." How is he to do that, we again and again ask? Since it does seem to be inevitably destined that passengers and guards and drivers are to be brought into mutual communication during transit, and to that end that guards are to be called upon to "ascertain the carriage from which the signal is made, and the reason," we must protest against the establishment of the dangerous, undignified, and unofficial practice of crawling along the tops of the carriages, which a recent inventor of strings and pulleys attempted to dignify by calling it "travelling to the carriage." If it be essentially requisite, as frequent practice has already proved it to be, that the guard occasionally *travel* from one carriage to another, let him, at least, have a proper and protected footway, without or within, along which to travel, and then the modern bell-hanger and the human tongue may render all further exercise of super-refined ingenuity on this *questio vexata* quite unnecessary.——That "the Queen may come in the cadger's way" has seldom been more curiously, though not quite literally, exemplified than in one or two instances of recent occurrence,—if all be true that is reported. In the first instance, it is said that a cadger in the shape of a railway porter or policeman came in the way of his Royal Highness Prince Albert lately, at one of the stations on the route from Scotland, very properly refusing him a light to his cigar,—being 'against the rules,'—a reason which we have no doubt the Prince would bold to be quite sufficient to exonerate the cadger, though